Non-technical Abstract

Angiosarcomas are rare soft tissue sarcomas; malignant angioendothelioma is a unique form of angiosarcoma which develops on the face and scalp of usually older people and carries a relatively poorer prognosis than other forms of sarcoma. The usual treatment is surgery to remove the lesion(s) followed by post-operative radiation therapy. However, in some cases the lesion(s) are not operable, and often the disease recurs after surgery and radiation treatment, indicating the need for drugs that induce a systemic anti-tumor immune response.

Administration of agents that modulate the immune system may be effective in restoring an immune response against the tumor. Interferon-alpha (IFN-α) is one agent known to modulate the immune system. IFN-α is also known to play a role in preventing cancer cell growth and preventing the formation of blood vessels in tumors. The recombinant protein has been approved for use in many clinical indications, including hairy cell leukemia, chronic hepatitis B and C, Kaposi's sarcoma, and chronic myelogenous leukemia.

In animal models, the partial or complete regression of several types of tumors has been observed following direct intratumoral administration of IFN-α Gene Medicine, a non-viral gene therapy consisting of a plasmid which expresses human interferon-alpha 2b formulated with the synthetic polymer polyvinylpyrrolidone in saline. When administered intratumorally to tumor-bearing mice, IFN-α Gene Medicine leads to a decrease in the rate of tumor progression, with complete tumor regression in some cases. In cases where tumor rejection occurs, the animals also demonstrate immunity to re-challenge with the same tumor cell type. These data suggest that administration of the IFN-α Gene Medicine leads to the generation of an anti-tumor immune response. It is anticipated that the anti-tumor immune response will promote tumor regression, inhibition of tumor progression, and/or prevention of metastasis in humans.

The clinical studies proposed are directed at expressing human IFN-α at a tumor site by non-viral, polymer-mediated delivery of a gene encoding IFN-α. This gene transfer is intended to induce expression of IFN-α in or around the tumor at levels sufficient to promote an anti-tumor response without high concentrations of IFN-α protein in the bloodstream. In animal experiments conducted to address this particular safety issue, a concentration of IFN-α plasmid DNA sufficient to bring about an anti-tumor response did not lead to significant systemic levels of the protein. In addition, preclinical toxicology testing in nonhuman primates demonstrated the absence of side effects of IFN-α Gene Medicine through the highest dose tested, 12 mg/kg. To date, IFN-α Gene Medicine has been administered by direct intratumoral injection in patients with another form of cancer (squamous cell carcinoma of the head and neck); doses of IFN-α Gene Medicine have ranged from 3-6 mg per injection and there have been no drug-related side-effects. Thus, IFN-α Gene Medicine may offer the advantage that the likelihood of occurrence of side effects observed after high dose systemic IFN-α treatment should be greatly reduced, if not eliminated.